

Hellbender Lesson / Teacher Instructions

Subject: Science

Grades: 6 - 9

Time: This lesson will vary according to modifications, class scheduling and grade levels. The lesson is approximately a two-day lesson for a standard 50-minute period.

Show Me Standards: Science Standards #3 and #4. Process Goals # 1.6, 1.10

6th-11th grade Science GLE's: LO1.A.6.a; LO.2.A.6.a; LO.2.A.8.a; LO.2.D.8.a; EC.1.A.6.a; EC1.B.6.a.b.c; EC.1.D.6.a.b.c; EC.3.C.6.a.b; EC.1.B.9,10,11.a; EC.1.C.9,10,11.a.b.c.; EC.1.D.9,10,11.a.b;EC.3.B.9,10,11.b; SI.1.A.6-11.a-g; SI.1.B.6-11.a-g

Background: The hellbender is the largest aquatic salamander in North America. This unique salamander lives in clear cold spring-fed rivers and streams. After 6 million years of adaptation this organism is becoming threatened and endangered in nearly 16 of the states that it is located.

Missouri is the only state that has both the eastern and Ozark hellbenders. The eastern hellbenders are typically bigger in size, tanish brown in color and have little to no markings. The Ozark hellbenders are usually smaller, greenish brown and have blotchy dark markings scattered along the dorsum.

In this lesson students will learn about this special creature and uncover the causes and effects of its present state. Students will learn that water quality and the hellbenders future are closely intermingled.

Materials:

- Students need a copy of the Missouri Department of Conservation booklet called: *The Hellbender - A unique and ancient species of aquatic salamander in great need of help to survive in our Ozark streams* by Tom R. Johnson and Jeff Briggler, herpetologists. This booklet is available from Missouri Department of Conservation offices or online at <http://www.mdc.mo.gov/nathis/herpetol/>.
- For each pair of students the following activity handout will be needed: The Hellbender Fact Sorting Activity Place Mat and a set of hellbender fact cards
- Hellbender Performance Event handout.
- Optional: MDC video, *Hellbender Mystery*, and *Save the Hellbender* stickers and / or posters. Contact Sherry Fischer, PO Box 180, Jefferson City, MO 65102-0180 or Sherry.Fischer@mdc.mo.gov.

Warm Up:

- Ask the students if they know what the name of arguably the ugliest and largest salamander in North America is called! Lead the students into a general discussion about the hellbender and explain that they are going to learn about this unique and ugly creature. This is a good time to let the students share any of their own experiences with this creature. In cases where students tell of inappropriate harming or hurting a hellbender explains that those types of activities are not wise and that they will find out why during the activities. Explain that the health of the hellbender is closely tied to stream and river water quality. If the *Hellbender Mystery* film is available, show the film at this time.
- Tell students they are going to get one piece of information about this unusual creature and then discover more by reading the booklet. Give each student one hellbender fact card. Have the students compare and contrast their fact cards. If appropriate have the students move about the room sharing cards. This will help to increase their level of oxygen and increase the level of curiosity and excitement for the activity. For older students, have them find other students who have the same type of information.

Lesson Reading Activities:

- Pass out the booklets. For a pre-reading activity, have the students skim through the booklet and examine all titles and pictures. Explain to them the fact on their card is somewhere in the reading.
- Have the students read the booklet and take notes as they read. Have students try to locate about 3 to 5 main ideas in each paragraph. This activity can be done independently, in small groups or teacher directed depending on the students reading level. In order to shorten the time spent on this activity, the booklet could be divided up between students or groups.
- After the students have read the pamphlet and recorded their main ideas have them do a movement activity called initial check. Tell the students that they are going to compare their facts with other students, by comparing their notes. Students then initial the facts on each other students' sheets that are the same or nearly the same. However, no one can initial anyone else's sheet more than once. This will assure that all students are communicating and sharing information. Play high tempo music at this time if you like.

Lesson Fact Sorting Activity:

- Have the students put away all materials and then give each pair or small group of students a Hellbender Fact Sorting Place Mat and a set of fact cards. Explain to the students they are to place the cards face down and take turns picking up and reading a card at a time. After reading the card the group or pair needs to decide what category on the place mat the fact on the card belongs to. They then need to place that card along the side of that area on the place mat. They need to continue the process taking turns reading cards until all the cards have been placed. Demonstrate the process if needed. Tell them to raise hands when they are finished with the process
- When a group finishes the sorting activity give them the key sheet that has the information from the cards sorted into place mat categories. Have one student pick out a card from each category at a time and read the information while another student checks to see if the fact card is in the correct category. Have them repeat this process until all cards in all categories are checked. Have students rotate jobs with each new category being checked. Some groups that work faster may have time to repeat the process while other groups finish up.

Wrap Up: Collect all the sets of placemats and cards. Give each student one card. Designate different areas of the room as a category area from the place mat. Have the students locate themselves in the area for their information on the fact card. Have each group read off their cards and relocate students as needed.

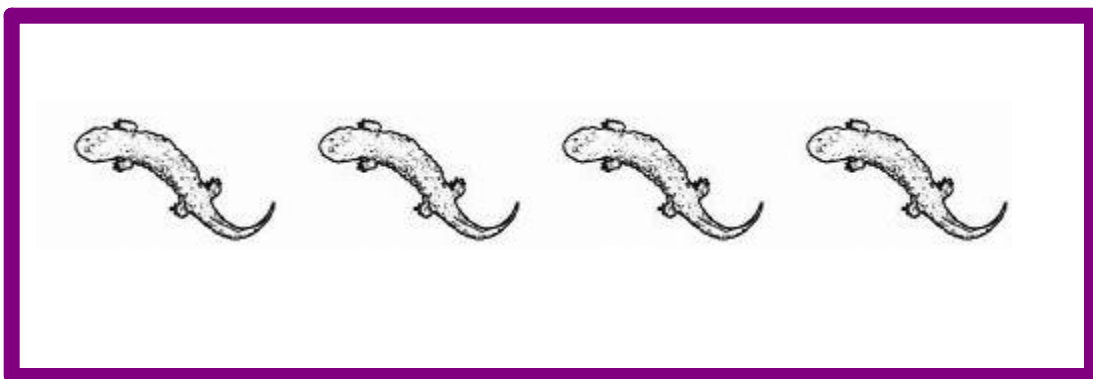
Assessment: Pass out the hellbender Performance Event and assign a point value to each level on the scoring guide as desired. After the assessment is graded and passed back, give students hellbender stickers if available. Explain that they now have enough information to explain to others why the hellbender should be saved. Provide posters to students as appropriate if available. Discuss other situations that may occur using the information they learned about the hellbender. Include situations that involve land use practices that threaten the hellbender. Allow students who did not perform as expected the opportunity to relearn the information and demonstrate adequate knowledge, so they can earn stickers and / or a poster as well.

Extensions: Have students create other scenarios that may occur allowing them to share information insuring protection of the hellbender.

Hellbender Fact Sorting Activity

Placemat

Physical Characteristics	Habitat
Behavior / Diet	Breeding Process
Life Cycle	Importance
Problems / Threats [Causes / Effects]	Protection



Largest salamander in North America	Adults typically range in length from 11 to 20 inches
Wide flat heads	Tiny eyes
Board vertically compressed tail	Prominent folds of skin
Dark blotches	Orange-brown belly
Oxygen is taken up by tiny blood vessels in skin.	Lungs are used primarily for buoyancy.
Fully aquatic (lives in the water only)	Captive breeding programs have not been successful.

<p>Needs cool, spring-fed, and clear streams and rivers that are unpolluted</p>	<p>Ozark Hellbenders (sub-species of eastern hellbender) are found only in south central MO in a few rivers.</p>
<p>Needs riffles to oxygenate the river</p>	<p>Needs large flat rocks to hide under</p>
<p>Missouri is the only state with both the eastern and Ozark hellbenders.</p>	<p>Courtship and breeding takes place in late summer and early autumn.</p>
<p>Walk along stream bottom</p>	<p>Spend most time hiding under rocks</p>
<p>Searches for food at night</p>	<p>Nocturnal so seem secretive</p>

Eats mainly crayfish	Seldom swim
Females are breeding age around 7 to 8 years of age.	Eggs are fertilized externally
A female may produce 200 to 700 eggs. Eggs are laid in a long strand.	The male spreads a cloud of sperm over the eggs and the males guard eggs.
Females may breed only every second or third year.	Eggs take 4 to 6 weeks to hatch.
Newly hatched hellbenders are about one inch long, have a yellow yolk sack, external gills and rudimentary limbs.	External gills start to recede in juveniles.

<p>At about two years of age the hellbender larvae lose their gills and are from 4 to 5 inches long.</p>	<p>In natural river conditions hellbenders typically live 30 to 35 years.</p>
<p>Keep crayfish populations in balance</p>	<p>Have been in North American for over 6 million years</p>
<p>Unique amphibian, which is a part of Ozark wildlife heritage</p>	<p>Helps to maintain biodiversity</p>
<p>Indicator of the overall health of a stream</p>	<p>Recent population decline average between 77% and 80% depending on river</p>

<p>Taken illegally by individuals and sold in pet trade</p>	<p>They are listed as rare, threatened or endangered in most states where they are found.</p>
<p>Minor to severe deformities such as lost or fused toes or missing limbs</p>	<p>Toxic chemical contamination of rivers</p>
<p>In-stream gravel mining</p>	<p>Removal of large flat rocks from stream beds</p>
<p>Free access of rivers by cattle</p>	<p>River siltation (excess sediments in river)</p>
<p>River nutrification (excess nitrogen in river)</p>	<p>Killed by anglers and or giggers</p>

They are listed as endangered in Missouri	Investigate water quality
Monitored and examined by biologist	Monitor populations
Increase public awareness and appreciation	Report sightings but, do not disturb habitat
Report illegal collection	Release if caught accidentally
Keep large flat stream rocks in place.	Fence riparian zones to exclude cattle
Move away from stream at least 100 feet before urinating or defecating.	Keep pollutants out of watersheds that drain into Ozark streams.

Hellbender Activity Answer Key

Physical Characteristics

- Largest salamander in North America
- Adults typically range in length from 11 to 20 inches
- Wide flat heads
- Tiny eyes
- Broad vertically compressed tail
- Prominent folds of skin
- Dark blotches, especially on juveniles
- Orangish-brown belly
- Oxygen is taken up by tiny blood vessels in skin
- Lungs are used primarily for buoyancy
- Fully aquatic (live in water only)

Habitat

- Hellbenders need cool, springs-fed, clear streams and rivers that are unpolluted
- Need riffles to oxygenate the river
- Ozark hellbender (sub-species of eastern hellbender) is found only in south central Missouri in a few rivers.
- Missouri is the only state with both the eastern and Ozark hellbenders.
- Need large flat rocks to hide under

Behavior / Diet

- Seldom swim
- Walk along stream bottom
- Spend most time hiding under rocks
- Search for food at night
- Nocturnal so seem secretive
- Eat mainly crayfish

Breeding Process

- Courtship and breeding take place in late summer and early autumn.
- Females are breeding age around 7 to 8 years of age.
- Eggs are fertilized externally.
- A female may produce 200 to 700 eggs. Eggs are laid in a long strand.
- The male spreads a cloud of sperm over the eggs and then the male guard eggs.
- Females may breed only every second or third year.
- Captivity breeding has not been successful.

Life Cycle

- Eggs take 4 to 6 weeks to hatch.
- Newly hatched hellbenders are about one inch long, have a yellow yolk sack, external gills and rudimentary limbs.
- External gills start receding in juvenile stage.
- At about two years of age the hellbender larvae lose their gills and are from 4 to 5 inches long.
- In natural river conditions hellbenders typically live 30 to 35 years.

Importance

- Keep crayfish populations in balance
- Have been in North America for over 6 million years.
- Unique amphibian, which is a part of Ozark wildlife heritage
- Help to maintain biodiversity
- Indicator of the overall health of a stream

Problems / Threats

- Recent population decline average between 77% and 80% depending on river
- Taken illegally by individuals and sold in pet trade
- Minor to severe deformities such as lost or fused toes or missing limbs
- They are listed as rare, threatened or endangered in most states where found.
- They are listed as endangered in Missouri
- Toxic chemical contamination of rivers
- In-stream gravel mining
- Removal of large flat rocks from stream beds
- Free access of rivers by cattle
- River siltation (excess sediments in river)
- River nutrification (excess nitrogen in river)
- Killed by anglers and or giggers

Protection

- Investigate water quality
- Monitored and examined by biologists
- Monitor populations
- Increase public awareness and appreciation
- Report sightings
- Report illegal collection
- Release if caught accidentally
- Do not disturb habitat
- Fence riparian zones to exclude cattle
- Move away from stream at least 100 feet before urinating or defecating.
- Keep large flat stream rocks in place.
- Keep pollutants out of watersheds that drain into Ozark streams.

Hellbender Performance Event

As a young person who loves the outdoors, you really enjoyed going to rivers in the Ozarks. You enjoyed the clear waters and cool waters on hot summer days. Your family and friends often times visit the river and enjoy canoeing, fishing and swimming. One day while fishing your a friend caught a hellbender on a lure! Everyone from your group of family and friends as well as other people near by, were all fascinated with the catch. Everyone wanted to see and touch this unusual creature with the slimly folded skin. Some people where even fearful of the creature and shouted to kill it. You all noticed that one of the limbs looked deformed as well. You remember learning about this awesome salamander in school. You know that this special creature needs to be protected. Explain what you are going to tell everyone about this creature. Include why the hellbender is special, the problems it faces and what should be done with it. Be specific as possible and to the point! You know that this salamander's fate is in your hands. See the scoring guide below to find out if you succeeded!

Hellbender is saved!	Hellbender stressed but saved.	The hellbender is not saved.
The student gives a clear and convincing argument that addresses the hellbenders importance, problems, and posed fate with clear, accurate and specific information.	The student gives a fairly convincing argument but does not include specifics for all three areas needing to be addressed.	The student fails to give a convincing argument for all three areas that is accurate, clear and specific.